

CHAPTER CONTENTS

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Examining Collisions 164PREREQUISITE
CONCEPTS AND SKILLS

- Newton's laws of motion
- Kinetic energy
- Gravitational potential energy
- Conservation of mechanical energy



The driver of the race car in the above photograph walked away from the crash without a scratch. Luck had little to do with this fortunate outcome, though — a practical application of Newton's laws of motion by the engineers who designed the car and its safety equipment protected the driver from injury.

You learned in Unit 1 that Newton's laws can explain and predict a wide variety of patterns of motion, such as the motion of a projectile and the orbits of planets. How can some of the same laws that guide the stars and planets protect a race car driver who is in a crash?

When Newton originally formulated his laws of motion, he expressed them in a somewhat different form than you see in most textbooks today. Newton emphasized a concept called a “quantity of motion,” which is defined as the product of an object's mass and its velocity. Today, we call this quantity “momentum.” In this chapter, you will see how the use of momentum allows you to analyze and predict the motion of objects in countless situations that you might not yet have encountered in your study of physics.